

CHAPTER 2

ACQUISITION CONTROL UNIT (ACU) AND PERIPHERALS

SECTION I. DESCRIPTION AND LEADING PARTICULARS

2.1.1 INTRODUCTION

The acquisition control unit (ACU) and associated peripherals (Figure 2.1.1) provide central control and user interface for the Automated Surface Observing System (ASOS). The ACU is used for data acquisition, processing, quality checks, storage, formatting, and output. The ACU is also used to control system self-test and diagnostics and to interface with all operator displays and external communications with the system. This Chapter provides the physical description, installation procedures, operation procedures, theory of operation, and maintenance procedures for the ACU and associated peripherals.

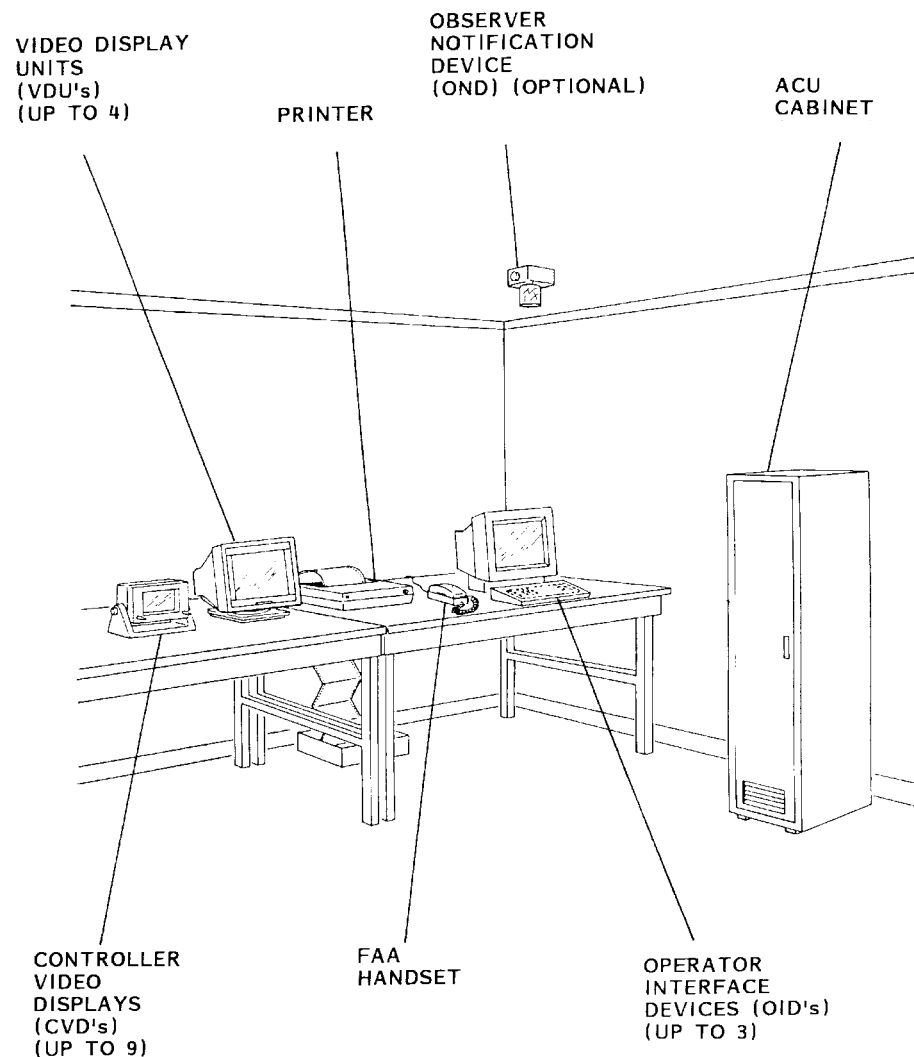


Figure 2.1.1. ACU and Peripherals

2.1.2 PHYSICAL DESCRIPTION

As shown in figure 2.1.1, a typical ACU/peripheral installation contains the following major units:

- a. ACU Cabinet, Unit 1
- b. Up to 17 Controller Video Displays (CVD's), Units 81 through 89 (first CVD location) and 91 through 98 (second CVD location)
- c. Printer, Unit 12
- d. FAA Handset, Unit 5
- e. Up to three Operator Interface Devices (OID's), Units 11, 21, and 31
- f. Optional Observer Notification Device (OND), Unit 6
- g. Up to ten Video Display Units (VDU's), Units 41 through 44 (first VDU location), Units 51 through 53 (second VDU location), Units 61 and 62 (third VDU location), and Unit 71 (fourth VDU location)

The ACU communicates with the data collection package (DCP) via either a radio frequency (rf) modem link or via a direct line link. When an rf modem link is used, an RF Antenna (1E1) is also connected to the ACU. Most sites use omnidirectional antennas. Yagi antennas and attenuators are installed at sites where co-channel interference is experienced. In addition to the above listed equipment, the ACU may be equipped with a video driver option that allows it to drive external airline displays which are not part of the actual ASOS.

2.1.2.1 Class I and Class II Systems. Throughout this Chapter and Chapter 3, a distinction is made between Class I systems and Class II systems. The Class I system is the basic model ASOS. This model will be installed at most Class I (non-towered) airports and other observation sites. The Class II ASOS is almost identical to the Class I system, except that all Class II systems have the following additional features to increase system availability and performance:

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- a. Uninterruptible power supplies (UPS's) and UPS bypass circuits in the ACU and DCP that allow the ASOS to operate in the event of a loss of facility ac power.
 - b. A third (redundant) pressure sensor in the ACU (Class I system has two). This third sensor allows the ASOS to continue to report altimeter settings and pressure data even if one of its three pressure sensors fails.
 - c. Redundant communications equipment for ACU/DCP data communications. This includes a second rf modem (or line driver) in both the ACU and DCP, and a second CPU in the DCP.
 - d. Electromagnetic interference (EMI) shielded ACU and DCP cabinets

These features are available as options for Class I systems.

2.1.2.2 **ACU Cabinet.** The ACU cabinet (Figure 2.1.2) measures 70 inches high, 25 inches wide, and 32 inches deep. For Class II systems, honeycombed rf filters in the front and rear doors of the cabinet and rf gaskets on the doors provide EMI shielding for up to 100 decibels (db). The cabinet contains five equipment racks, a battery box, a blower, and a connector panel. Brief descriptions of these components are provided in table 2.1.1.

2.1.2.2.1 **ACU Tie-Down.** In earthquake prone areas, the ACU is anchored down (at sites not using equipment shelters) with two sections of construction "U" channel and attaching hardware (including associated materials). The ACU tie-down installation method is determined by the material that the ACU is being attached to (wood or concrete). The ACU tie-down installation procedure (including all parts and tools needed) is contained in table 2.5.32. ACU's installed in equipment shelters that are in earthquake prone areas will use a different anchoring scheme, which is as yet undetermined.

2.1.2.3 **Controller Video Displays (CVD's).** The ACU can drive up to nine CVD's located in the airport control tower for use by air traffic controllers. Each CVD is a liquid crystal display (LCD) that may be either a free standing unit or panel mounted. The CVD displays the following information:

- a. Wind direction and speed
- b. Altimeter setting
- c. Most recent hourly meteorological report (METAR) data

2.1.2.4 **Printer.** The printer is a dot matrix type printer that features several fonts and print quality modes. The features, operation, and maintenance of this printer are explained in the corresponding printer operation manual. Refer to paragraph 2.5.7 for printer setup procedures. The following types of information are automatically printed:

- a. Initials of persons signed on and off system
- b. 1-minute observations before and after editing
- c. Equipment and communications failures \$
- d. Reason for alarms
- e. Daily and monthly summaries
- f. Hourly meteorological reports (METAR's) and SPECI's at end of day (15 minutes past midnight)
- g. Edits to meteorological reports (METAR's) by the observer \$

The printer also produces hard copies of OID displays in response to user requests.

2.1.2.5 **FAA Handset.** The FAA handset allows operators to monitor audio weather reports generated by the ASOS and to append verbal comments to the audio reports.

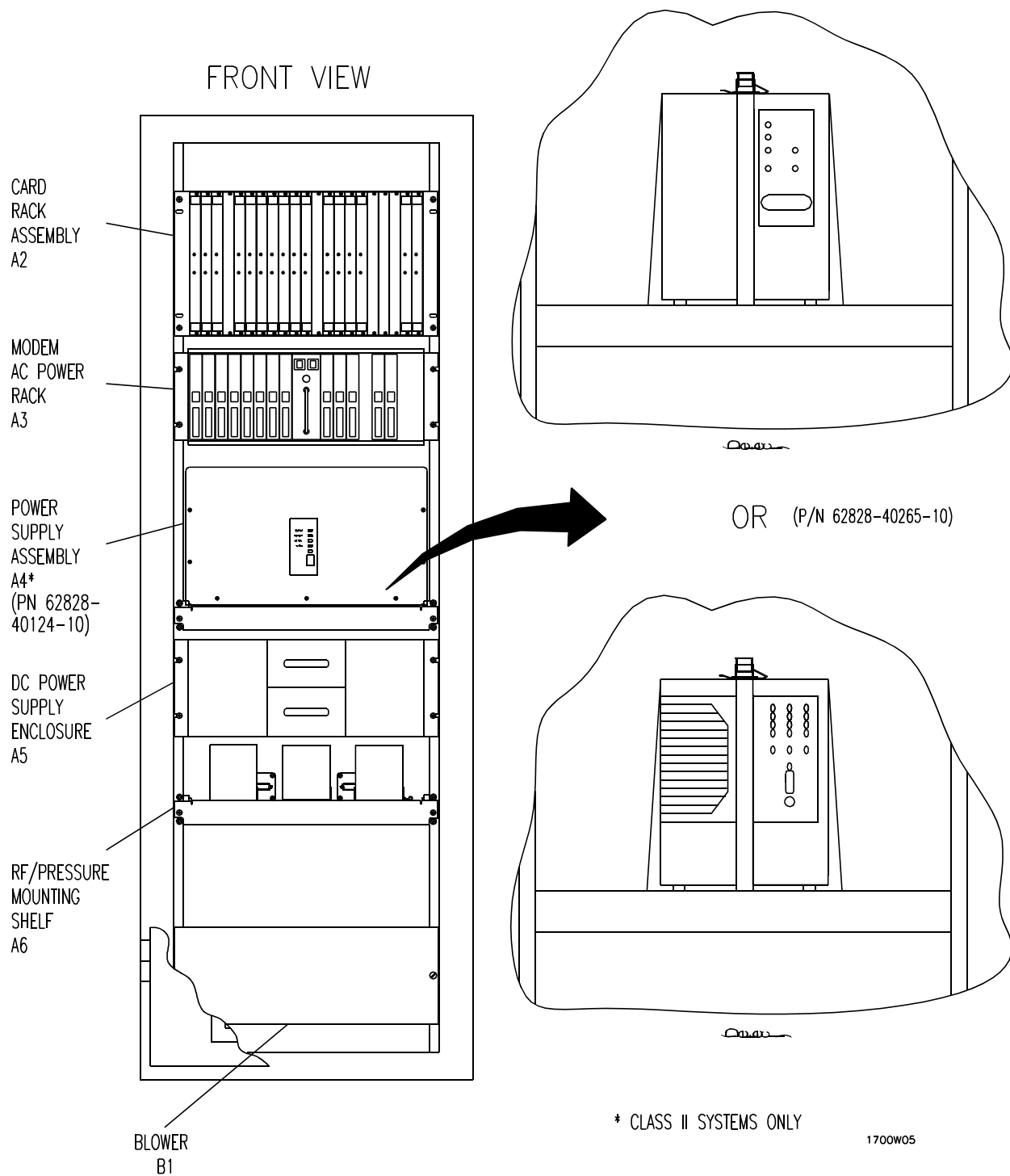


Figure 2.1.2. ACU Cabinet Unit 1 Locational View (Sheet 1 of 2)

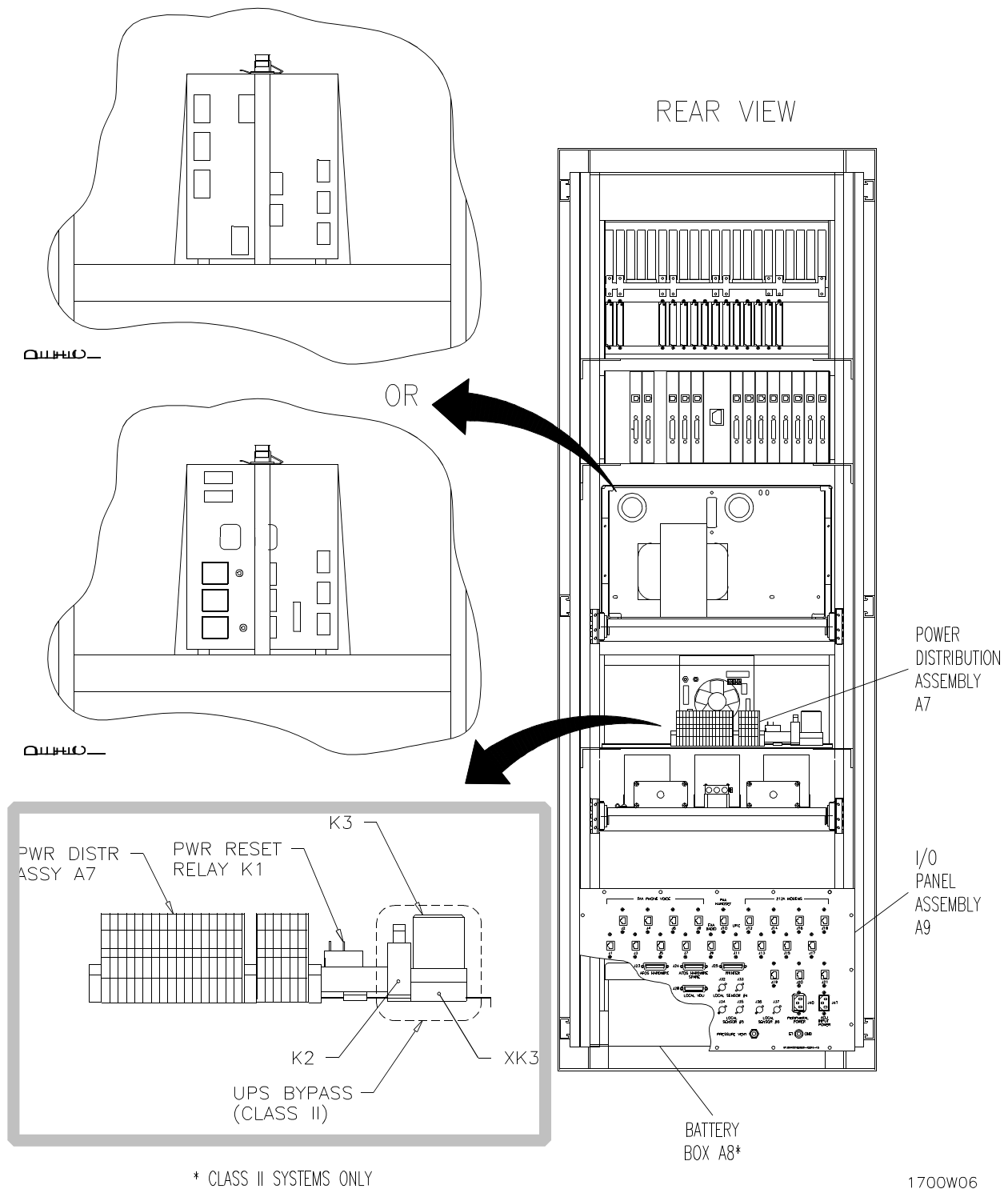


Figure 2.1.2. ACU Cabinet Unit 1 Locational View (Sheet 2)

Table 2.1.1. ACU Cabinet Major Assemblies

Unit	Name	Figure	Purpose
1A1	Codex Modem	-	ADAS modem, refer to Chapter 13.
1A2	Card Rack Assembly	2.1.3	Contains up to 16 circuit boards that perform all of the data processing and input/output (I/O) functions associated with the ACU.
1A3	Modem AC Power Rack	2.1.4	Contains up to 10 modems, which are used for all telephone communications with the ACU. May also contain up to two line drivers for ACU/DCP communication (when rf modems are not used).
1A4	Power Supply Assembly	2.1.5	Provides an uninterruptible power supply (UPS) that supplies power to the ACU in the event of main facility power loss. The UPS supplies ac power for the ACU cabinet, printer, and primary OID for a minimum of 10 minutes. Power Supply Assembly 1A4 is installed in Class II systems and in Class I systems where it has been installed as an option. Power Supply Assembly 1A4 may be one of two different assemblies. Power supply assembly, part number 62828-40124-10 (Figure 2.1.5, sheet 1), is installed in systems having serial numbers 437 and below and contains UPS part number 62828-90057. Systems having serial numbers 438 and above contain power supply assembly 62828-40265-10 (sheet 2). This assembly contains either UPS part number 62828-90338-10 or 62828-90338-20.
1A5	DC Power Supply Enclosure	2.1.6	Rack containing two dc power supplies. Each power supply provides +5V, +12V, and -12V for the ACU cabinet.
1A6	RF/Pressure Mounting Shelf	2.1.7	Slide-mounted shelf containing rf modems and pressure sensors. For Class I systems, the shelf contains one rf modem (unless communication is by line driver) and two pressure sensors. For Class II systems, the shelf contains a second rf modem, an rf modem switch, and a third pressure sensor. For Class II systems using line driver communication, rf modems are not installed and an LD1/LD2 switching board replaces the rf modem switch.
1A7	Power Distribution Assembly	-	Terminal strip that distributes ac and dc power within the ACU. Contains Power Reset Relay K1 and in Class II systems contains UPS Bypass Relays K2 and K3.
1A8	Battery Box	2.1.8	Contains either four or five 12-volt batteries for the UPS. Battery Box 1A8 may be one of three different assemblies. Battery box part number 62828-40063-10 contains five batteries, which are used with power supply assembly part number 62828-40124-10. Battery box part number 62828-40063-30, referred to as the interim battery box, contains four batteries and packing material and is used with power supply assembly part number 62828-40265-10. Battery box part number 62828-40262-20, referred to as the production model battery box, is similar to part number 62828-40063-30 but is physically smaller. It contains four batteries and is also used with power supply assembly part number 62828-40265-10.
1A9	I/O Panel Assembly	2.1.9	The main interface panel for all external connections to the ACU. Main facility power is applied to the system via AC INPUT POWER connector J41 on this panel. PERIPHERAL POWER connector J40 is controlled by the UPS (in Class II systems) and supplies UPS ac power to the primary OID and printer.
B1	Blower	-	Cools the ACU cabinet.

2.1.2.6 **Operator Interface Devices (OID's)**. The OID consists of a display and a keyboard and provides full control over all aspects of the ASOS. The ACU may have multiple OID's. One local OID, also known as the primary OID, is located within 100 feet of the ACU. Two secondary OID's (not shown) may be located up to 3 miles from the ACU. Communication using remote OID's is accomplished over telephone lines using modems. There are four types of OID users: observers, air traffic controllers, system managers, and technicians. Different log-on sequences and passwords for each type of user allow tailored control of the appropriate systems. Only those displays pertinent to the particular user are available to that user.

2.1.2.7 **RF Antenna**. The rf antenna enables ACU/DCP communications and operates within the ASOS operating frequency (410.075 or 410.950 MHZ). Because the rf antenna is an omnidirectional antenna, its use reduces the placement restrictions of the DCP's. Most sites use the omnidirectional antennas. Yagi antennas and attenuators are installed at sites where co-channel interference is experienced.

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2.1.2.8 **Observer Notification Device (OND)**. One of the ASOS configurations includes an OND, which is an alarm light, similar to the on-the-air indicators used in radio stations. The OND light blinks on and off to alert the observer or air traffic controller that a report (METAR or SPECI) is soon to be transmitted and that it may be edited during the pretransmission period. The OND light blinks until the edit time ends and the report is transmitted.

2.1.2.9 **Video Display Unit (VDU)**. Up to four VDU's can be placed at various locations in the airport. The VDU is a 12-inch diagonal monochrome cathode ray tube (CRT) display. The VDU displays the current ASOS 1-minute weather observations and the most recently transmitted METAR.

2.1.2.10 **Airline Displays**. The ACU can have a number of airline displays distributed throughout the airport complex. These displays are industrial terminals without keyboards that are not a part ASOS. Each airline display presents ASOS 1-minute weather observations and other OID displays.


2.1.3 ACU CONFIGURATIONS

The ACU (P/N 62828-40044) has six possible configurations as shown below:

- 10 Class II system as described in paragraphs 2.1.2 and 2.1.2.1. The -10 system uninterruptible power supply is built by SOLA. The SOLA battery box contains five 12V lead-acid batteries.
- 20 Standard Class I system as described in paragraphs 2.1.2 and 2.1.2.1.
- 30 Class II system as described in paragraphs 2.1.2 and 2.1.2.1. The -30 system's uninterruptible power supply is built by DELTEC. The DELTEC battery box contains four 12V lead-acid batteries.
- 40 Class I system as described in paragraphs 2.1.2 and 2.1.2.1. The -40 system includes an uninterruptible power supply built by DELTEC.
- 50 Class I system as described in paragraphs 2.1.2 and 2.1.2.1. The -50 system includes a third pressure sensor installed for improved reliability.
- 60 Class I system as described in paragraphs 2.1.2 and 2.1.2.1. The -60 system includes an uninterruptible power supply built by DELTEC and a third pressure sensor installed for improved reliability.

A2 SLOT NO.																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
62828-47006-10 CPU	62828-47006-20 CPU	62828-47008-20 ACU MEMORY	62828-47028-20 OR PSD MEMORY	62828-47013-10 SIO, RS-422	62828-47014-10 SIO, RS-232	62828-47014-20 SIO, RS-232	62828-47014-30 OR SIO, RS-232	62828-47014-40 OR SIO, RS-232	62828-47014-50 OR SIO, RS-232	62828-47014-60 OR SIO, RS-232	62828-90034-2 BLANK PANEL	62828-47016-10 ANALOG/DIGITAL	62828-47003-10 VME RESISTOR	62828-47033-10 DIGITAL I/O	62828-47017-10 OR CRT CONTROLLER	62828-90034-2 BLANK PANEL	62828-90034-2 BLANK PANEL	62828-90034-2 BLANK PANEL	62828-47018-10 VOICE PROCESSOR	62828-47018-10 VOICE PROCESSOR

Figure 2.1.3. Card Rack Assembly 1A2

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
MODEM 1 (V.3225) - OID 3B 	MODEM 2 (V.3225) - OID 3B	MODEM 3 (V.3225) - OID 3C	MODEM 4 (2440) - USER PHONE 1	MODEM 5 (2440 or V.3400) - USER PHONE 2	MODEM 6 (2440) - FAA CVD	MODEM 7 (2440) - VDU	MODEM 8 (2440) - AWIPS	POWER SUPPLY MODULE		MODEM 9 (2440) - USER PHONE 1 SPARE	MODEM 10 (2440) - USER PHONE 2 SPARE OR OID SPARE		LINE DRIVER #1	LINE DRIVER #2	
*	*	*			*	*	*			*	*	*	*		

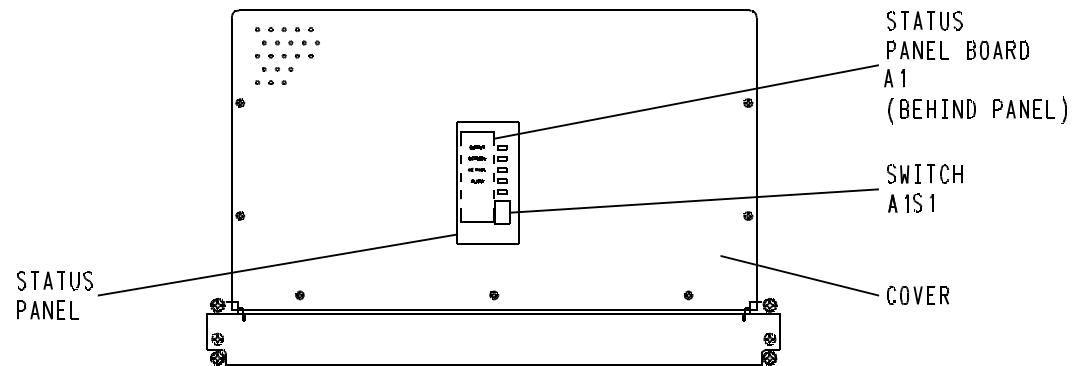
*OPTIONAL (ALL EXCEPT A4 AND A5)

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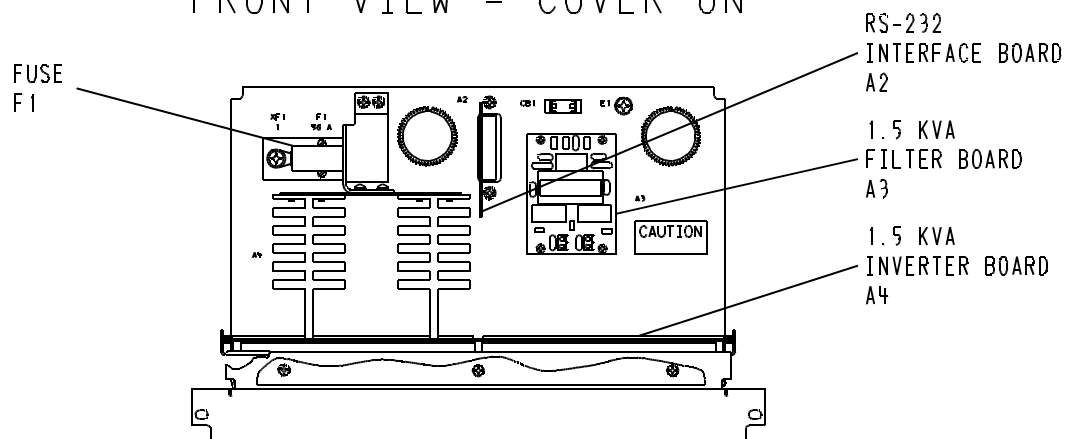
NOTE

USER ASSIGNMENTS MAY VARY FROM SITE TO SITE.
ASSIGNMENTS SHOWN ARE TYPICAL

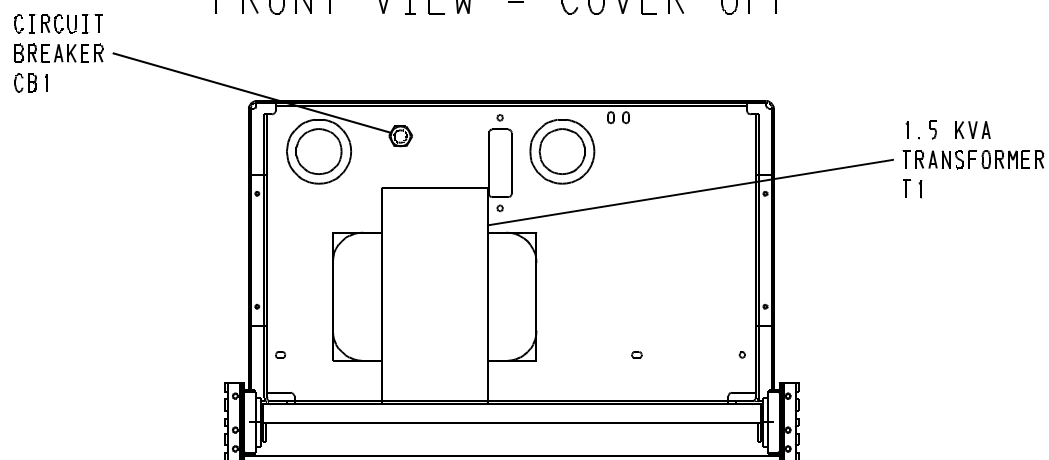
Figure 2.1.4. Modem AC Power Rack 1A3



FRONT VIEW - COVER ON



FRONT VIEW - COVER OFF

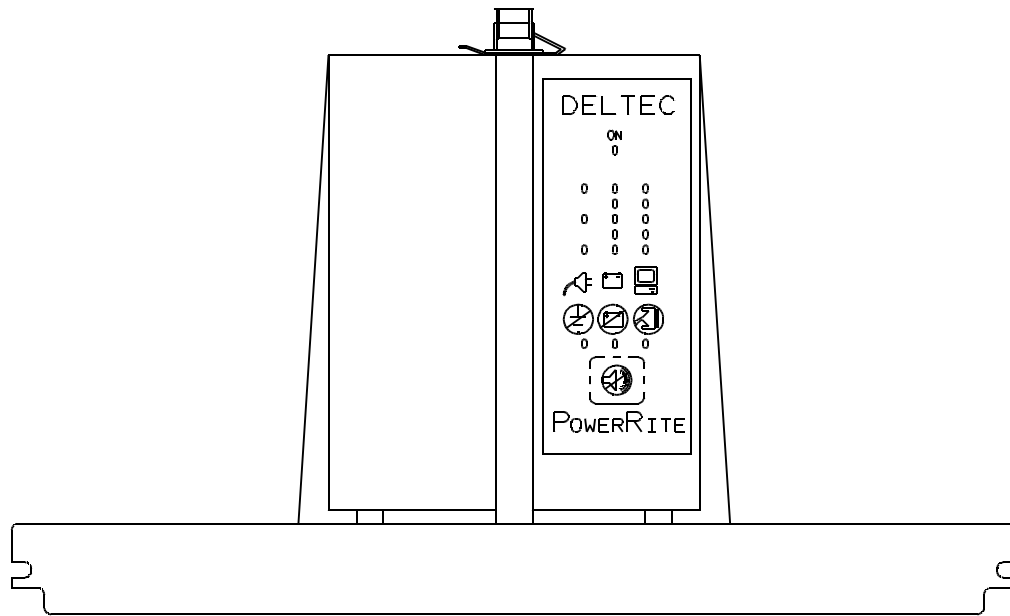


REAR VIEW

NOTE: POWER SUPPLY ASSEMBLY 1A4 INSTALLED ON
CLASS II SYSTEMS
POWER SUPPLY ASSEMBLY 62828-40124-10

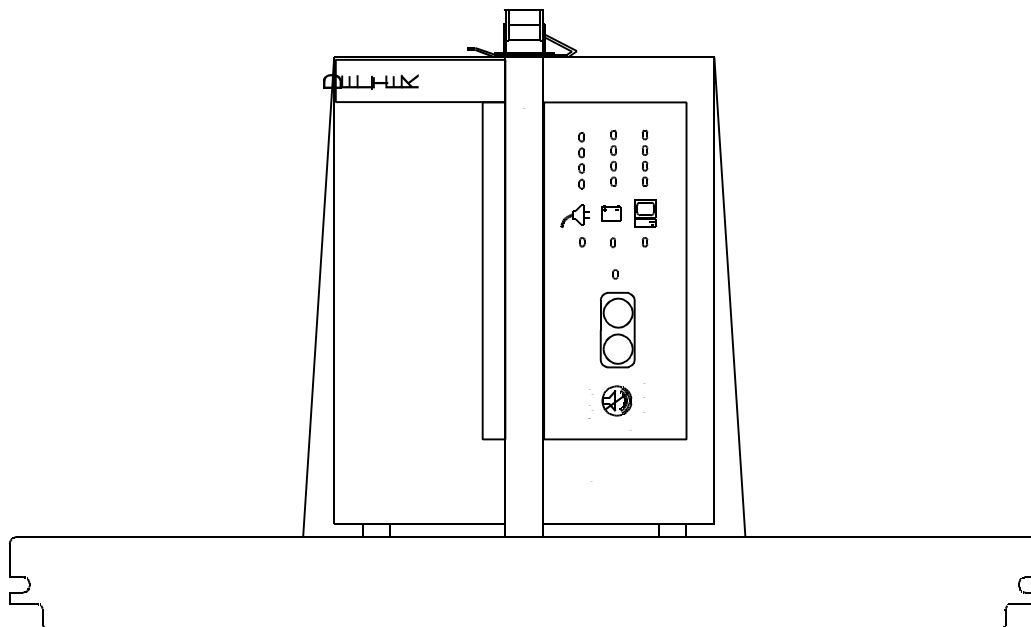
1700A12

Figure 2.1.5. Power Supply Assembly 1A4 (Sheet 1 of 2)



FRONT VIEW

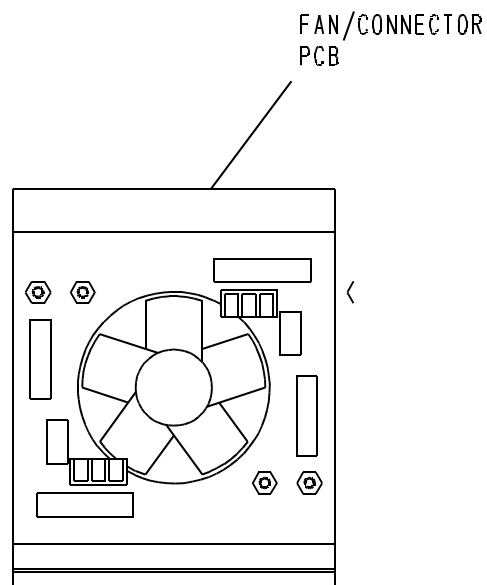
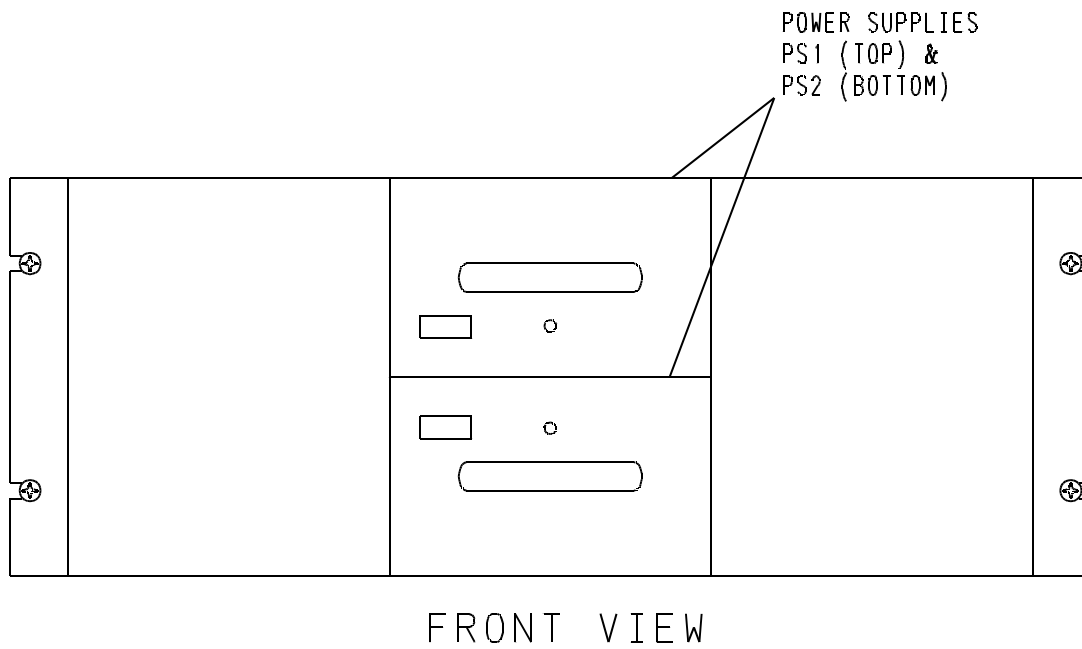
ASOS Site Technical Manual - Assembly - Power Supply Assembly 1A4 (Sheet 2)



FRONT VIEW

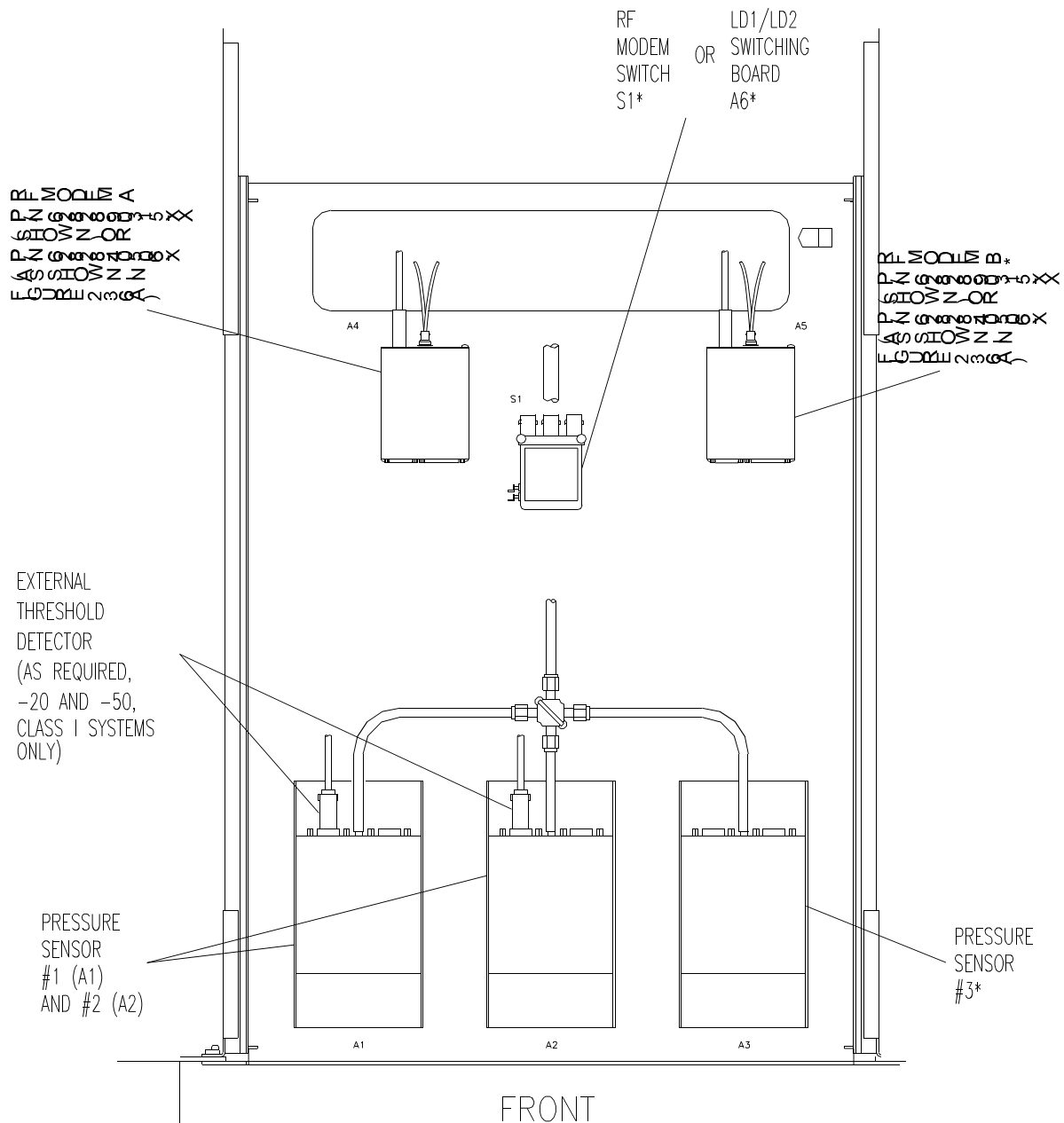
ASOS Site Technical Manual - Assembly - Power Supply Assembly 1A4 (Sheet 2)

Figure 2.1.5. Power Supply Assembly 1A4 (Sheet 2)



1700A1

Figure 2.1.6. DC Power Supply Enclosure 1A5



* INSTALLED ON CLASS II SYSTEMS.

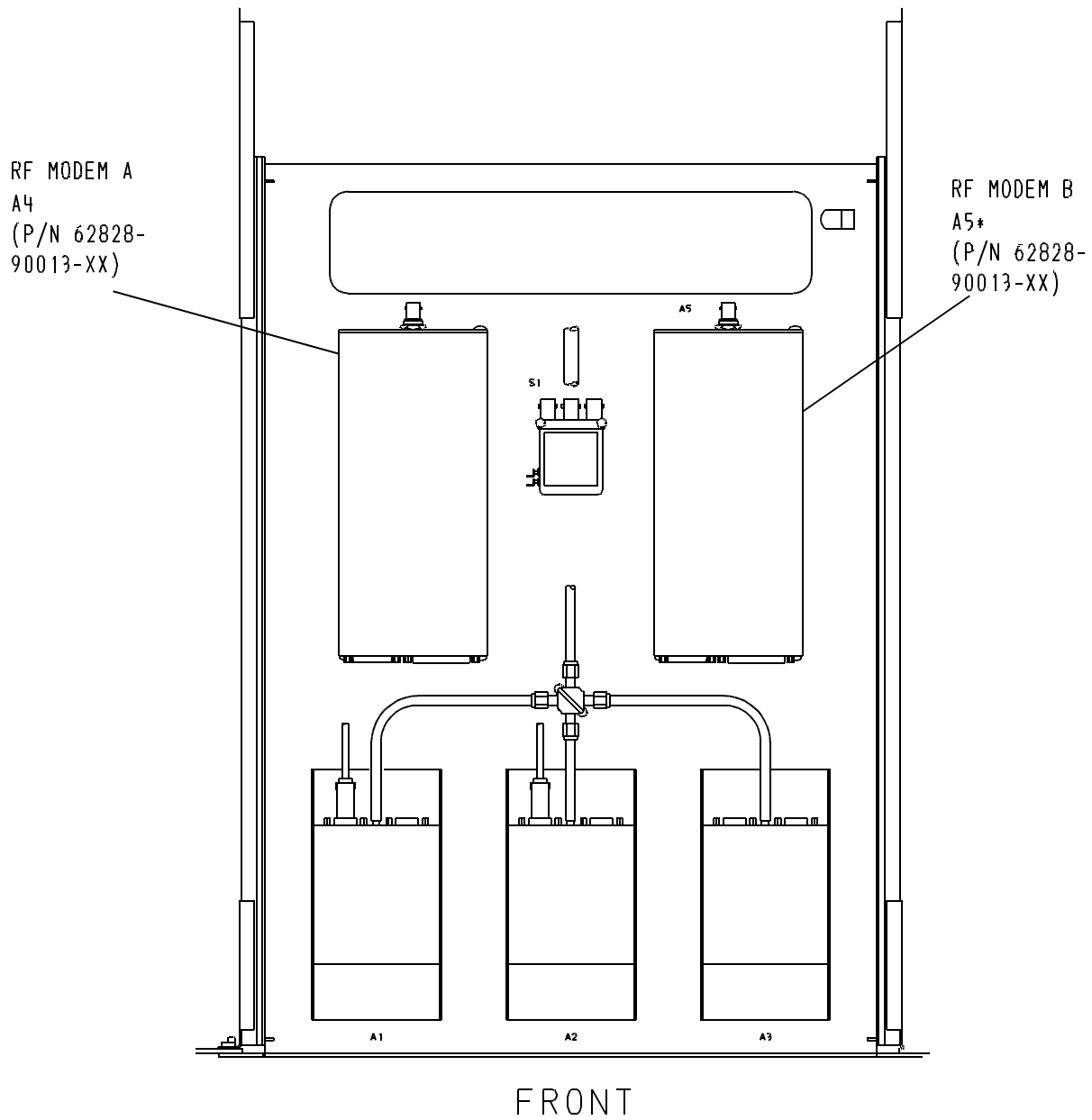
NOTE

RF MODEMS AND RF SWITCH NOT INSTALLED ON SYSTEMS
USING LINE DRIVERS 1A3A14 AND 1A3A15

LINE DRIVER RELAY NOT INSTALLED ON SYSTEMS USING
RF MODEMS

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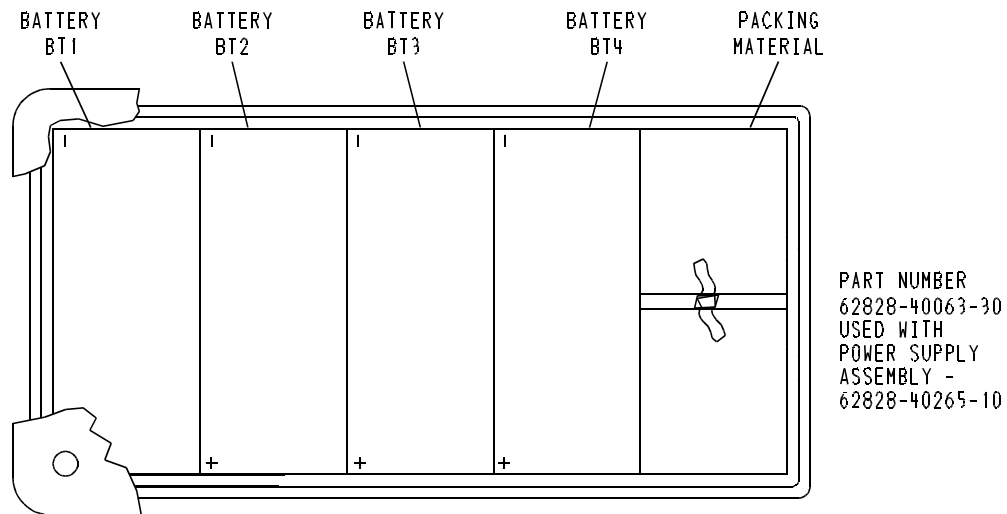
Figure 2.1.7. RF/Pressure Mounting Shelf 1A6 (Sheet 1 of 2)



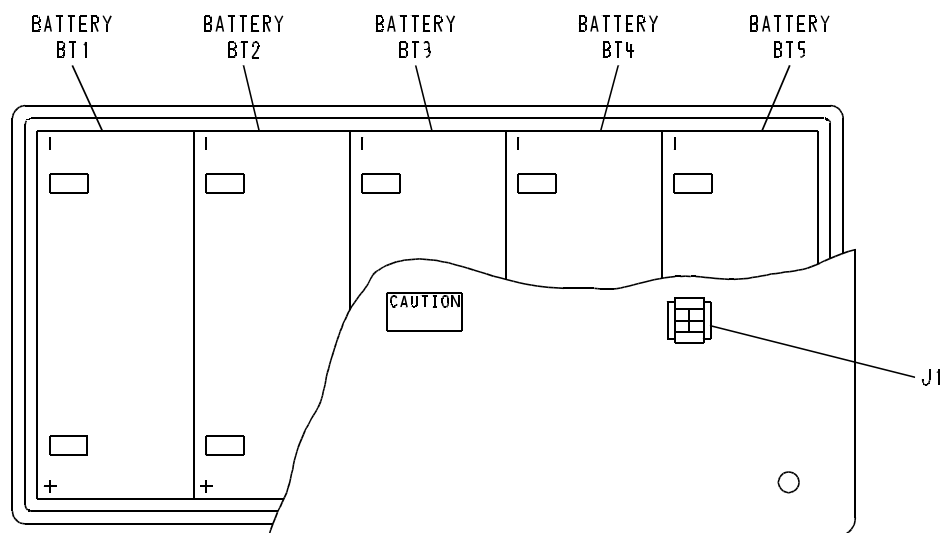
* INSTALLED ON CLASS II SYSTEMS.

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Figure 2.1.7. RF/Pressure Mounting Shelf 1A6 (Sheet 2)



TOP VIEW



TOP VIEW

PART NUMBER 62828-40063-10 USED WITH
POWER SUPPLY ASSEMBLY - 62828-40124-10

NOTES:

1. PORTION OF TOP COVER SHOWN.
2. BATTERY BOX 1A8 INSTALLED ON ALL CLASS II SYSTEMS AND ON THOSE CLASS I SYSTEMS WHERE IT HAS BEEN INSTALLED AS AN OPTION.

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Figure 2.1.8. Battery Box 1A8

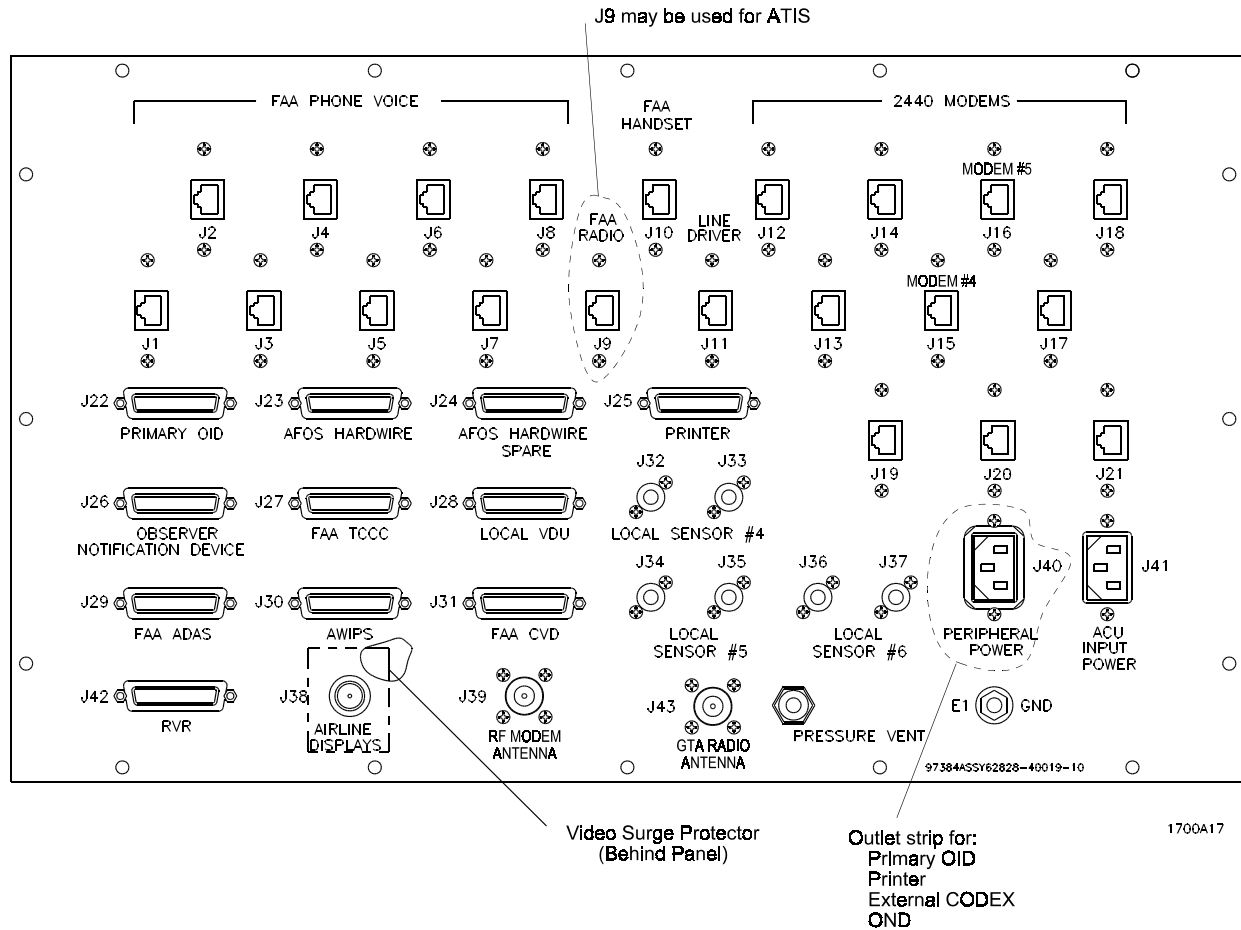


Figure 2.1.9. I/O Panel Assembly 1A9